IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 9, September 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.625

© 2024 IJIRCCE | Volume 12, Issue 9, September 2024| DOI: 10.15680/IJIRCCE.2024.1209039

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.625| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Qualitative Analysis of Vending Machine Technology

Biju Balakrishnan[1], Chinmayee Patil[2], Sakshi Phanse[3], Prathamesh Salunkhe[4], Shraddha Satpute[5]

Professor, Department of Electronics & Telecommunication Engineering, SIES Graduate School of Technology, Maharashtra, India[1]

Undergraduate, Department of Electronics & Telecommunication Engineering, SIES Graduate School of Technology, Maharashtra, India[2-5]

ABSTRACT: This review paper critically evaluates recent literature on smart vending machine design, highlighting key drawbacks and gaps identified across various studies. Through a comprehensive analysis of advancements in coin acceptors, display systems, and accessibility features, this paper uncovers recurring limitations in functionality, user experience, and technological integration. The review emphasizes areas where current research falls short, such as insufficient consideration of motor selection, integration challenges, and inclusive design principles. By synthesizing these insights, the paper aims to provide a clearer understanding of existing issues and propose directions for future research to enhance automated retail environments.

KEYWORDS: smart vending, limitations, functionality, technological integration, user experience.

I. INTRODUCTION

The advancement of smart vending machine technology has the potential to transform automated retail experiences by enhancing functionality, accessibility, and user engagement. However, a review of recent studies reveals several critical shortcomings that limit the effectiveness and adaptability of current vending machines. This paper provides a detailed examination of these limitations, focusing on key aspects such as coin acceptors, display systems, accessibility features, and payment technologies. By identifying recurring issues and gaps in the literature, the paper aims to offer a comprehensive analysis of the current state of vending machine technology and propose directions for future research and development. The goal is to address the identified shortcomings and advance the design of vending machines to better meet the diverse needs of users and operational environments.

II. LITERATURE SURVRY

The literature survey serves as a foundational element of this review paper, systematically examining existing research on vending machine systems to identify and analyze their limitations. This survey encompasses a broad range of scholarly articles, technical papers, and industry reports that address various aspects of vending machine technologies, including design, functionality, user experience, and technological advancements.

During our survey, we identified several technological drawbacks related to vending machine projects based on existing references:

The vending machine's coin acceptor is limited to 5-rupee and 10-rupee coins, restricting its use in regions with different denominations and requiring frequent adjustments for currency changes. Additionally, the machine's reliance on a 12-volt power supply could pose challenges in areas without stable access to this voltage, potentially complicating installation and operation [1].

The system currently only supports text recognition and reading in English. There are no options for multilingual support, which limits its usefulness for users who need assistance with texts in other languages. The integration of Optical Character Recognition (OCR), Text-to-Speech (TTS), and image processing involves a complex setup. This complexity can be challenging for users who are not familiar with programming or technical troubleshooting, making the system difficult to set up and maintain for non-technical individuals. The system's text capture and reading processes can be

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.625| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

slow, especially when using the graphical user interface (GUI). This can affect efficiency, with the GUI being less user-friendly and slower compared to alternative methods like a switch button [2].

The effectiveness of the voice module in broadcasting reminders depends on its clarity and volume. Poor quality or inaudible reminders could impact user experience. The system's user interface might not be intuitive for all users, particularly those unfamiliar with the technology or who have visual impairments. This could limit the accessibility and ease of use of the vending machine [3].

The cashless payment device is limited to MIFARE and EM-Marin RFID cards, restricting its compatibility with other payment methods and reducing its adaptability in regions with different card standards. Additionally, the device relies on a stable local network (Ethernet or WiFi) for transaction processing. In areas with poor network connectivity, transaction efficiency may suffer, potentially requiring upgrades to network infrastructure to ensure reliable operation [4].

Speech recognition systems may struggle with varying accents, background noise, and unclear pronunciation, leading to errors in transcribing and interpreting commands. The effectiveness of speech recognition relies on high-quality audio input. Poor microphone quality or ambient noise can significantly impact performance. The proposed system's reliance on Python and specific modules may limit its compatibility with other platforms or applications beyond MS-Word and MS-PowerPoint [5].

The paper mentions that the assistant is built differently from existing ones and may not overcome previous bugs. This suggests potential limitations in handling errors or unexpected inputs effectively [6].

Vending machines might struggle with recognizing specific voice commands, especially if the user's speech is unclear or if there is background noise [7].

CNN-based speech recognition systems may struggle in noisy environments, affecting their accuracy in areas with significant background noise. For UAVs, this could reduce reliability in outdoor or urban settings. Additionally, training and running CNNs require substantial computational resources, such as powerful processors and large memory, which may be impractical to include in a UAV's onboard system, limiting the feasibility of deploying these models in real-time scenarios [8].

The vending machine has several key issues affecting its functionality and user experience. First, it relies on an external laptop to display QR codes for payments and product details, complicating the user experience by necessitating interaction with two separate devices. Additionally, the manually created Braille keypad may not adhere to standardized Braille conventions, potentially making it difficult for blind users to navigate effectively. Compounding this problem is the lack of feedback from blind users, which means the machine's accessibility features have not been practically tested, potentially leading to usability issues. The machine's heavy wooden construction poses practical challenges, including difficulties in moving or relocating it, reducing its flexibility. Furthermore, the servo motor's limited capacity restricts the range of products that can be dispensed, as it cannot handle heavier items. The coin acceptor's design limits it to only three specific coin types and cannot detect counterfeit coins, creating inconvenience for users and potential financial risks. Lastly, the voice interface provides slow and verbose responses, making interactions time-consuming and frustrating for users.

While reviewing the paper, we also discovered several notable advantages of this vending machine technology: The review highlights several advantages of the vending machine technology. Voice-based commands enable hands-free operation, particularly benefiting visually impaired users by allowing them to navigate and control the machine through speech alone. Speech recognition technology in Python enhances this further by converting spoken commands into text, making interactions seamless. The machine's flexible payment system supports both cash and digital transactions, offering users multiple payment options. Additionally, the SMS gateway allows transactions via text messages, accommodating users with unreliable mobile internet or those who prefer not to use touch screens. Lastly, the machine's support for multiple languages improves accessibility, ensuring it is user-friendly for individuals from diverse linguistic backgrounds [9].

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.625| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

III. CONCLUSION

This review paper identifies key limitations in existing vending machine technologies, including problems with coin acceptors, display systems, accessibility features, and payment methods. These issues affect the overall functionality, user experience, and flexibility of vending machines. Future research and development should focus on expanding the versatility of coin acceptors, improving multilingual and accessibility features, and integrating more reliable payment and communication systems. Addressing these challenges will enhance vending machines' usability, efficiency, and adaptability, leading to a more inclusive and streamlined automated retail experience that better meets diverse user needs and operational contexts.

REFERENCES

1. M. G. C. Gangmei, S. S. Singh and B. Shougaijam, "Design of low cost voice operated vending machine using V3 module," 2021 IEEE 2nd International Conference on Applied Electromagnetics, Signal Processing, & Communication (AESPC), Bhubaneswar, India, 2021, pp. 1-4, doi: 10.1109/AESPC52704.2021.9708486. keywords: {Renewable energy sources; Costs; Power supplies; Pandemics; Speech recognition; Maintenance engineering; Airports; Arduino; Touchless; Voice recognition;V3 module; Vending machine},
2. H. U. Zaman, S. Mahmood, S. Hossain and I. I. Shovon, "Python Based Portable Virtual Text Reader," 2018 Fourth International Conference on Advances in Computing, Communication & Automation (ICACCA), Subang Jaya, Malaysia, 2018, pp. 1-6, doi: 10.1109/ICACCAF.2018.8776778. keywords: {Raspberry Pi;Graphical User Interface (GUI);T esseract Optical Character Recognition(OCR); Python; Text-To-Speech(TTS);Image Processing; eSpeak; Virtual Reader; Camera; Audio},
3. R. Ming and C. Zhao, "Design and Development of Smart Snack Vending Machine," 2022 International Conference on Computing, Robotics and System Sciences (ICRSS), Macau, China, 2022, pp. 100-103, doi: 10.1109/ICRSS57469.2022.00030.keywords:{Wireless communication; Codes; Gears; Inspection; Hardware; Software; Mobile handsets; Intelligent vending machine;STM32;infrared;Wireless communication; Mobile terminals},
4. V. P. Semenov, V. V. Chernokulsky and N. V. Razmochaeva, "The cashless payment device for vending machines — Import substitution in the sphere of vending," 2017 International Conference "Quality Management, Transport and Information Security, Information Technologies" (IT&QM&IS), St. Petersburg, Russia, 2017, pp. 798-801, doi: 10.1109/ITMQIS.2017.8085948. keywords: {Companies; Servers; Protocols; Program processors; Customer services; Mobile handsets; vending; vending machines; electronic device; cashless payment; Mifare; EM-Marin},
5. Garg, H. Solanki and S. Verma, "Automation and Presentation of Word Document Using Speech Recognition," 2020 International Conference for Emerging Technology (INCET), Belgaum, India, 2020, pp. 1-5, doi: 10.1109/INCET49848.2020.9154078. keywords: {Speech recognition; Forensics; Python; Personal digital assistants; Task analysis; Internet; Speech Recognition; Voice commands; Intelligent Personal Assistant; Automating documents},
6. A. Kumar, D. Kaur and A. K. Pathak, "VOICE ASSISTANT USING PYTHON," 2022 International Conference on Cyber Resilience (ICCR), Dubai, United Arab Emirates, 2022, pp. 1-4, doi: 10.1109/ICCR56254.2022.9995997. keywords: {Computers; Error analysis; Computer bugs; Buildings; Personal voice assistants; Internet; Task analysis; Virtual Personal Assistant; Artificial Intelligence; Voice Recognition; Python;text to speech},
7. S. Subhash, P. N. Srivatsa, S. Siddesh, A. Ullas and B. Santhosh, "Artificial Intelligence-based Voice Assistant," 2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4), London, UK, 2020, pp. 593-596, doi: 10.1109/WorldS450073.2020.9210344. keywords: {Google; Task analysis; Speech recognition; Python; Personal digital assistants; YouTube; Voice control; AI-based Voice Assistant; GTTS Engine; Playsound; Python},
8. C. M. J. Galangque and S. A. Guirnaldo, "Speech Recognition Engine using ConvNet for the development of a Voice Command Controller for Fixed Wing Unmanned Aerial Vehicle (UAV)," 2019 12th International Conference on Information & Communication Technology and System (ICTS), Surabaya, Indonesia, 2019, pp. 93-97, doi: 10.1109/ICTS.2019.8850961. keywords: {Speech recognition; Engines; Unmanned aerial vehicles; Training; Mel frequency cepstral coefficient; Feature extraction; Convolutional neural networks; convolutional neural network; speech recognition system; audio processing; unmanned aerial vehicle (UAV)}
9. B. Balakrishnan, A. Chaurasiya, M. Deshmukh, S. Kelaskar, S. Wamorkar, and IJIRCCE, "Vending Machine for Blind," International Journal of Innovative Research in Computer and Communication Engineering, vol. 12, no. 1, pp. 123-128, 2024.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details